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Upper extremity

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Revision Arthroscopic Bankart Repair Results in High Failure Rates and a Low Return to Duty Rate Without Recurrent Instability

S.E. Slaven, M.A. Donohue et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.08.044>

Purpose: The purpose of this study was to determine, in a military population without critical bone loss, the rate of recurrent instability after revision arthroscopic stabilization for failed primary arthroscopic Bankart repair.

Methods: Forty-one revision arthroscopic stabilizations were performed at a single military institution between 2005 to 2016 for recurrent anterior shoulder instability after primary arthroscopic Bankart repair. Minimum follow-up was 2 years, and shoulders with glenoid bone loss >20% were excluded. The primary outcome of interest was the incidence of failure, defined by recurrent instability.

Results: Age at revision surgery averaged 22.9 ± 4.3 years, and 88% were either service academy cadets or active duty combat arms soldiers. Mean follow-up was 7.8 years. Twenty-three patients (56%) returned to duty without recurrent instability after revision arthroscopic stabilization. Eighteen patients (44%) experienced recurrent instability after return to duty. Glenoid bone loss averaged 6.2% (95% confidence interval [CI], 3.2%-9.2%) in the successful group and 5.7% (95% CI, 3.1%-8.3%) in the failure group ($P = .808$).

Conclusions: Revision arthroscopic stabilization of failed primary arthroscopic Bankart repair has a failure rate of 44% in a young military population. The similar amounts of bone loss between groups indicates that bone loss is not the primary determinant of failure in revision arthroscopic stabilization.

Level of Evidence: IV, Case Series

The Arthroscopic Trillat Procedure Is a Valuable and Durable Treatment Option for Recurrent Anterior Instability Associated With Massive Irreparable Cuff Tears

P. Boileau, G. Clowez, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.10.045>

Purpose: The purpose of the present study is to report the mid- and long-term clinical and radiologic outcomes of the arthroscopic Trillat for the treatment of recurrent anterior instability in patients with chronic massive irreparable rotator cuff tears (MIRCTs) and maintained active shoulder motion where reverse shoulder arthroplasty (RSA) is not indicated.

Methods: Twenty-one consecutive patients (mean age 61 years) were identified and retrospectively reviewed. All patients had recurrent anterior dislocations and conserved active forward elevation and active external rotation. The MIRCTs included a retracted (stage 3) supraspinatus tear in 14%, a supra- and infraspinatus tear in 76.5%, and a 3-tendon tear in 14%. A closed-wedge osteotomy of the coracoid was performed, and the coracoid was fixed above the subscapularis with a cannulated screw (10 cases) or suture buttons (11 cases). We followed patients with x-rays and computed tomography scan at 6 months, along with Subjective Shoulder Value, visual analog scale, Walch, Constant, and Rowe scores. The mean clinical and radiographic follow-up was 58 months (24-145 months).

Results: Overall, 96% (20/21) of the patients had a stable and functional shoulder and were satisfied with the procedure; no patient lost active shoulder motion. The Subjective Shoulder Value increased from 44% (10%-75%) to 94% (80%-100%), $P < .001$. The Constant and Rowe scores improved from 60 (25-81) to 81 (66-96) and from 54 (35 to 65) to 92 (70-100), respectively ($P < .001$). Among the 13 patients practicing sports before surgery, 10 (77%) went back to sports. At last follow-up, only 1 patient was revised to RSA.

Conclusions: The arthroscopic Trillat procedure is a valuable and durable option for the treatment of recurrent anterior dislocations in older patients with chronic MIRCTs and conserved active shoulder motion.

Level of Evidence: Level IV, therapeutic case series.

The Arthroscopic Trillat Procedure Is a Valuable Treatment Option for Recurrent Anterior Instability in Young Athletes With Shoulder Hyperlaxity

P. Boileau, G. Clowez, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.10.046>

Purpose: The purpose of this study is to report the outcomes of the all-arthroscopic Trillat procedure, combined with capsular plication, for the treatment of recurrent anterior instability in young athletes with shoulder hyperlaxity (external rotation >90°).

Methods: We performed a retrospective evaluation of patients with recurrent anterior instability and shoulder hyperlaxity who underwent an arthroscopic Trillat between 2009 and 2019. Patients with concomitant rotator cuff lesions or voluntary or multidirectional instability were excluded. The osteotomized coracoid was fixed above the subscapularis with a cannulated screw or a suture button; a capsular plication was systematically associated. We followed patients with x-rays, computed tomography scans, and Subjective Shoulder Value, visual analog scale, Walch, Constant, and Rowe scores. Mean follow-up was 56 months (24-145).

Results: Twenty-eight consecutive patients (30 shoulders) with a mean age of 25 years were identified, and all met criteria. The main finding under arthroscopy was a “loose shoulder” with anteroinferior capsular redundancy and no or few (10%) labrum tears, glenoid erosion (13%), or Hill-Sachs lesions (10%). At last follow-up, 90% of the shoulders (27/30) were stable, and 79% (19/24) of the patients practicing sports returned to their preinjury activity level. The Walch-Duplay and Rowe scores improved from 54 (38-68) to 81 (4-100) and 55 (30-71) to 84 (45-100), respectively, $P < .001$.

Conclusions: The arthroscopic Trillat is an effective procedure for the treatment of recurrent anterior instability in young athletes with shoulder hyperlaxity but no substantial humeral or glenoid bone loss, allowing return to overhead/contact sports.

Level of Evidence: Level IV, retrospective study.

Endoscopic Release Superficial Rather Than Deep to the Transverse Carpal Ligament for Carpal Tunnel Syndrome Improves Immediate Postoperative Transient Symptomatic Exacerbation With Fewer Absences From Work

R. Wei, C. Chen, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.09.013>

Purpose: To determine the endoscopic release superficially rather than deep to the transverse carpal ligament to reduce the incidence of transient symptomatic exacerbation and postoperative absence from work in patients with carpal tunnel syndrome.

Methods: From January 2012 to January 2018, patients with idiopathic carpal tunnel syndrome who underwent one-portal endoscopic release superficial to the transverse carpal ligament (ERSTCL) were analyzed. For comparison, a cohort treated with the conventional Chow endoscopic release between February 2008 and October 2013 were included. Transient worsening of symptoms, discrimination sensation, and days off work were assessed. The minimal clinically important difference was calculated for discrimination sensation. Severity of symptom and functional status also were assessed using the Levine-Katz Questionnaire. Significance was set at $P < .05$.

Results: There was a significant difference between the ERSTCL group and the control group regarding the incidence of symptomatic exacerbation 1 week after surgery (2% vs 9%; $P = .003$) but no difference in other time intervals within the initial 3 months. There was a significant difference in 2-point discrimination 1 week (mean change = -0.13 , 95% confidence interval [CI] -0.30 to 0.04 , $P = .01$) and 2 weeks after surgery (mean change = -0.18 , 95% CI -0.36 to -0.01 , $P = .033$). Postoperative 1 and 2 weeks, 28% and 35% patients in ERSTCL group achieved a minimal clinically important difference, respectively. Compared with control group, the difference in frequencies was statistically significant (28% vs 45%; $P = .027$; 35% vs 57%; $P = .015$). The difference between the 2 groups in postoperative absence from work was statistically significant (95% CI 1.083-4.724; $P = .002$), with an average reduction in sick leave of 3 days in ERSTCL group. At a mean follow-up of 3 years, no significant difference was found between the groups regarding symptom and function statuses.

Conclusions: Endoscopic release superficial rather than deep to transverse carpal ligament for carpal tunnel syndrome improves immediate postoperative transient symptomatic exacerbation, which allows the patients to return to work earlier.

Level of Evidence: Level III, retrospective comparative study.

Return to Sport After Arthroscopic Bankart Repair With Remplissage: A Systematic Review

K. Gouveia, E. Harbour, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.12.032>

Purpose: To determine the return-to-sport rate following arthroscopic Bankart repair with remplissage (ABR), including overall rate of return to sport, rate of return to preinjury level of sport, and the rate of return for specific subgroups such as contact or throwing athletes.

Methods: EMBASE, PubMed, and MEDLINE were searched from database inception until February 2022. Studies were screened by 2 reviewers independently and in duplicate for data regarding rates of return to sport following ABR. Data on return to sport and functional outcomes were recorded. Data are presented in a descriptive fashion.

Results: Overall, 20 studies were included with a total of 736 patients (738 shoulders) who underwent ABR. These patients had a mean age of 28 years (range 14-72 years) and were 83% male. Mean follow-up time after surgery was 45 months (range 12-127 months). The rate of return to any level of sport ranged from 60% to 100%, whereas the rate of return to the preinjury level ranged from 63% to 100%. When we excluded those who underwent ABR as a revision procedure, the rate of return to any level of sport was 68% to 100%. Lastly, the return to sport rates for contact or collision athletes ranged from 80% to 100%, whereas for overhead or throwing athletes it was 46% to 79%. The rate of recurrence of instability postoperatively ranged from 0% to 20% in included studies.

Conclusions: For athletes with anterior shoulder instability, ABR led to a high rate of return to sport along with a low rate of recurrence of instability. Although most athletes are able to return to the same level of sport, certain groups such as throwing athletes may face greater difficulty.

Level of Evidence: Level IV, systematic review of Level III and IV studies.

Surgical treatment of shoulder instability in active-duty service members with subcritical glenoid bone loss: Bankart vs. Latarjet

K.S. Min, J. Wake

DOI: <https://doi.org/10.1016/j.jse.2022.10.011>

Introduction: Subcritical bone loss has been identified as a risk factor for potentially inferior outcomes following typical arthroscopic soft tissue repair. One alternative that has been presented as an option for patients with bone loss is the Latarjet, an ipsilateral coracoid transfer to the anteroinferior glenoid. The purpose of this study is to compare the outcomes between the arthroscopic Bankart repair and the open Latarjet for the treatment of anterior shoulder instability in patients with subcritical bone loss. We hypothesize that the open Latarjet will provide higher patient-reported outcome measure scores and lower rates of dislocation.

Methods: A retrospective cohort comparison of patients with anterior glenohumeral instability procedures was performed. Inclusion criteria included symptomatic anterior shoulder instability, subcritical glenoid bone loss (13.5%-24%), surgical treatment with arthroscopic Bankart repair or open Latarjet, and minimum follow-up of 2 years. Outcomes included recurrent instability (defined as postoperative dislocation or subjective subluxation), permanent physical restrictions, Western Ontario Shoulder Index (WOSI), and Single Assessment Numeric Evaluation (SANE) scores.

Results: Forty-seven patients were included, 25 of whom underwent an arthroscopic Bankart repair and 23 patients an open Latarjet. The average bone loss was 17.8% and 19.3%, respectively. Overall, 8 patients experienced recurrent instability, 6 in the arthroscopic Bankart group and 2 in the open Latarjet group ($P = .162$). The average postoperative SANE score for arthroscopic Bankart group was 48% and for the open Latarjet group, 84% ($P < .001$). The average postoperative WOSI score for the arthroscopic Bankart group was 53.6% and for the open Latarjet group, 67.9% ($P = .069$). There were significantly more patients placed on permanent physical restrictions in the arthroscopic Bankart repair group (16) compared with open Latarjet (3) ($P < .001$).

Conclusion: In patients with subcritical glenoid bone loss (defined as 13.5%-24%), patients treated with an open Latarjet have insignificantly higher SANE and WOSI scores and lower permanent physical restrictions than patients treated with an arthroscopic Bankart repair. We found no statistically significant difference in recurrent instability rates between the open Latarjet and arthroscopic Bankart repair ($P = .162$).

Level of evidence: Level III, Retrospective Cohort Comparison, Treatment Study

Arthroscopic findings of the glenohumeral joint in symptomatic anterior instabilities: comparison between overhead throwing disorders and traumatic shoulder dislocation

T. Funakoshi, T. Takahashi

DOI: <https://doi.org/10.1016/j.jse.2022.10.005>

Background: The term shoulder instability refers to a variety of mechanisms and clinical presentations. One of the common pathologies of throwing disorders is internal impingement with anterior instability. Most throwing athletes with symptomatic internal impingement with anterior instability exhibit positive apprehension and relocation test results, whereas those with recurrent anterior shoulder instability display positive apprehension test results. While the glenoid labrum-inferior glenohumeral ligament complex is a significant critical stabilizer for the prevention of anterior shoulder dislocation, the characteristics of the essential lesion in internal impingement with anterior instability have not been determined yet. This study aimed to compare the intra-articular lesion of athletes with internal impingement related to the overhead throwing motion in athletes with a traumatic shoulder dislocation.

Methods: Sixty-one athletes (all men; mean age, 25.2 ± 12.6 yr) who underwent an arthroscopic procedure were divided into 2 groups: 25 in the throwing group and 36 in the dislocation group. All shoulders had subtle glenohumeral instability defined by a positive anterior apprehension test and a relocation test. Those with voluntary and multidirectional instability and large glenoid bone loss (more than 25%) were excluded from the current study. All shoulders were evaluated for the following evidence: rotator cuff injury, superior labrum tear anterior and posterior lesions, labral pathologies including Bankart lesions, osteochondral lesions to the humeral head, biceps tendon fraying or rupture, and inferior glenohumeral ligament and middle glenohumeral ligament (MGHL) conditions.

Results: Arthroscopic findings of the throwing group showed more supraspinatus injuries (92% and 25%, $P < .001$), type II superior labrum tear anterior and posterior lesions (60% and 3%, $P < .001$), posterosuperior labral lesions (92% and 39%, $P < .001$), and hypoplastic MGHLs (56% and 6%, $P < .001$) and lesser Bankart lesions (8% and 92%, $P < .05$) than those of the dislocation group.

Conclusion: These results indicate that the characteristic lesions of internal impingement with anterior instability in throwing athletes include partial thickness rotator cuff tears, superior labrum tear anterior and posterior lesions, posterosuperior labral tears, and hypoplastic MGHLs. As expected, the physiopathology of internal impingement with anterior instability in throwing athletes may be related to the dysfunction of the anterosuperior glenohumeral capsular ligament, including the MGHL, rather than the inferior glenohumeral ligament as in traumatic anterior shoulder dislocations. These findings would be useful for defining treatment strategies for internal impingement with anterior instability in overhead throwing athletes.

Level of evidence: Level III, Epidemiology Study, Cross-Sectional Cohort Comparison

Low resilience is associated with decreased patient-reported outcomes following arthroscopic rotator cuff repair

S.T. Tracy, B.C. Werner

DOI: <https://doi.org/10.1016/j.jse.2022.09.028>

Background: The purpose of this study was to evaluate the relationship between preoperative resiliency and outcomes following arthroscopic rotator cuff repair (ARCR). The hypothesis was that patients with low preoperative resilience would have poorer postoperative patient-reported outcomes compared to patients with high preoperative resilience following ARCR.

Methods: Eighty-one consecutive patients undergoing ARCR over a 1-year period at a single institution were prospectively evaluated. Baseline evaluation included a Brief Resilience Scale (BRS), range of motion, and the following patient-reported outcomes (PROs): visual analog scale for pain (VAS), the American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES), Veterans RAND 12-Item Health Survey (VR-12), and the Single Assessment Numeric Evaluation (SANE) tests. PROs and range of motion were reassessed at a minimum of 2 years postoperatively. Patients were divided based on the baseline BRS score into low resilience (LR), normal resilience (NR), and high resilience (HR), and outcome scores were calculated for each group. Additionally, a regression analysis was performed to evaluate predictors of the final ASES score as a continuous variable.

Results: Despite similar baseline characteristics and postoperative range of motion and VAS scores, patients with LR had poorer postoperative ASES scores compared with patients with HR. The postoperative ASES score was 69 in the LR group, compared with 90 in the HR group ($P = .031$). Satisfaction was 78% in the LR group, compared with 100% in the HR group ($P = .086$). Based on regression analysis, the final ASES score increased 1.6 points for every 1-point increase in resilience.

Conclusion: Preoperative low resilience is associated with an >20-point drop in postoperative ASES scores following ARCR. This difference is present despite similar baseline characteristics, suggesting that the psychological contribution to postoperative outcomes is substantial.

Level of evidence: Level III, Retrospective Cohort Design, Prognosis Study

The POSI study: gender differences in 94 cases of postoperative shoulder surgery infection: results of a 7-year retrospective multicenter study

C. Orban, P. Goetti

DOI: <https://doi.org/10.1016/j.jse.2022.09.023>

Background: Contrary to lower limb infection, POstoperative Shoulder surgery Infection (POSI) often involves *Cutibacterium acnes*. Our aim was to describe patient characteristics and pathogens retrieved in POSI to guide initial empiric antibiotic selection with suspected infection during revision. We also compared microorganisms in infection following trauma, arthroplasty (AP), and arthroscopy (AS).

Methods: A multicenter retrospective study from 2010 to 2016 reviewed laboratory databases and medical records to identify patients with a previous shoulder surgery and a confirmed shoulder infection. The following procedures were included: AP, AS, fracture fixation (FF), and another open surgery (OS). A confirmed shoulder infection was defined as 2 positive cultures or more of the same microorganism, or clear clinical infection with 1 positive culture or more.

Results: Among the 5 hospitals and 28 surgeons involved, 94 POSI cases were identified. Mean age was 59 years at index surgery (range: 22-91) with a majority of men (n = 70, 74%). Among POSI cases, AP was the most common index surgery (n = 41), followed by FF (n = 27), AS (n = 16), and OS (n = 10). The median time between index surgery and the first positive sample was 5 months and the mean was 23 months (minimum 6 days to maximum 27 years), illustrating a positively skewed distribution. *Cutibacterium* spp were identified in 64 patients (68%), including 59 *C acnes* patients (63%), which was the most frequent germ in all 4 surgical groups. In 86% of cases, *C acnes* was identified at the first revision. The other 2 most common germs were *Staphylococcus epidermidis* and *Staphylococcus aureus*, with 29% and 17%, respectively. Polymicrobial infection was present in 30% of patients. Gender analysis revealed that *C acnes* was twice as frequent in men (male = 52 of 70, female = 7 of 24; $P < .001$). *S epidermidis* was more prevalent in women (n = 11; 46%) compared with men (n = 16; 21%) ($P = .032$). *C acnes* infection was most frequent in arthroscopic surgery (n = 14; 70%, $P = .049$). *S epidermidis* was 3 times more prevalent in chronic than in acute cases.

Conclusion: Empiric antimicrobial therapy following POSI, while waiting for culture results, should cover *C acnes*, *S epidermidis*, and *S aureus*. There is a significant gender difference regarding POSI culture results. *C acnes* is more frequent in men, but should still be covered in women as it was found in 29% of cases.

Level of evidence: Level IV, Case Series, Treatment Study

Comparative analysis of superior capsule reconstruction between long head of biceps tendon autograft and human dermis allograft

D.S. Kim, J.Y. Han

DOI: <https://doi.org/10.1016/j.jse.2022.08.006>

Background: Although many superior capsule reconstruction (SCR) techniques are currently practiced in clinical settings, guidelines for choosing the appropriate graft material are lacking. Therefore, at most times, the surgeon's personal preference becomes the deciding factor. This study compared 2 fairly recent SCR techniques—SCR with biceps tendon (BT) autograft and SCR with human dermis (HD) allograft—by evaluating clinical and radiologic outcomes to aid the surgeon's decision in choosing the appropriate graft.

Methods: Thirty-one patients underwent SCR using BT autograft (SCR BT), and 22 underwent SCR using HD allograft (SCR HD). SCR BT was selected for patients with a partial BT tear <20%, no severe inflammation signs, and favorable anchor conditions. SCR HD was performed in patients with a BT tear >20%, a superior labrum anterior-posterior (SLAP) lesion, severe inflammation, or subluxation. Range of motion (ROM), strength and shoulder function scoring, plain radiography, and magnetic resonance imaging were evaluated before and after surgery at regular intervals.

Results: In the SCR BT group, forward flexion ROM increased from $122^{\circ} \pm 43^{\circ}$ to $149^{\circ} \pm 18^{\circ}$ at 2 years postoperatively, whereas in the SCR HD group, forward flexion ROM improved from $129^{\circ} \pm 28^{\circ}$ to $149^{\circ} \pm 18^{\circ}$. In the SCR BT group, internal rotation (IR) ROM increased from 5 ± 3 to 6 ± 2 at 2 years postoperatively, whereas in the SCR HD group, IR ROM improved from 5 ± 3 to 6 ± 1 . Although ROM, strength, visual analog scale score, American Shoulder and Elbow Surgeons score, and Constant score all improved 2 years after surgery, no statistically significant differences were found. Six months after surgery, graft thickness was 3.58 ± 0.384 mm in the SCR BT group and 2.49 ± 0.326 mm in the SCR HD group ($P < .001$). At 2 years postoperatively, graft thickness was 3.54 ± 0.399 mm in the SCR BT group and 2.49 ± 0.306 mm in the SCR HD group ($P < .001$). The SCR HD group showed a negative correlation of -0.475 between graft thickness and IR ROM ($P = .026$). In the SCR BT group, a negative correlation of -0.466 was found between graft thickness and IR ROM ($P = .008$). A positive correlation of 0.363 was found between IR ROM and the acromiohumeral distance when the results were compared before and 2 years after surgery ($P = .045$).

Conclusion: Both SCR using BT autograft and SCR using HD allograft tissue showed favorable results, and no significant difference was noted between the 2 techniques. Given that the 2 techniques show equally favorable results, the surgeon's personal preference in choosing the SCR technique appears to be acceptable. Understanding the costs and patient's characteristics may aid the surgeon in deciding on the graft material.

Level of evidence: Level III, Retrospective Cohort Comparison, Treatment Study

Anatomic restoration of the articular deep layer is a definitive factor for repair status in delaminated rotator cuff tear

H. Yoshimura, K. Hiyama

DOI: <https://doi.org/10.1016/j.jse.2022.09.025>

Background: Recent studies have focused on the deep layer in delaminated rotator cuff tears. However, no studies have discussed the relationship between repair success and the properties of the deep layer. Herein, we aimed to analyze the intraoperative repair tension of the deep layer with respect to clinical outcomes and repair integrity and to evaluate the clinical results of delaminated rotator cuff tears after dual layer-specific repair.

Methods: A total of 202 patients with delaminated rotator cuff tears had undergone dual layer-specific suture bridge repair; the mean follow-up duration was 28.6 (24-72) months. Intraoperatively, the repair tension of the deep layer was measured using a tensiometer, and mobility was ranked as easy or tight. After repair of the deep layer, the superficial layer tension was measured and ranked in a similar fashion. Clinical outcomes were evaluated using the Constant score, American Shoulder and Elbow Surgeons score, and subjective shoulder values. The relationship between retear and intraoperative qualitative factors of tendons was investigated. Prognostic factors for retear were analyzed using multiple logistic regression analyses.

Results: Postoperative retears occurred in 11 (5.4%) patients. With regard to the deep layer, the tight mobility group had greater tear size, tendon retraction, and fatty infiltration of the supraspinatus and infraspinatus than the easy mobility group. No intergroup difference in postoperative retear rate was observed between the tight and easy deep-layer groups. Logistic regression analysis showed that fatty infiltration of the infraspinatus (odds ratio, 3.1; 95% confidence interval, 1.3-7.7; $P = .013$) and mobility of the superficial layer after deep layer repair (odds ratio, 8.1; 95% confidence interval, 1.7-38.1; $P = .008$) were predictors of retear.

Conclusion: Intraoperative mobility in the deep layer was not directly related to postoperative retear. Conversely, the quality of the infraspinatus concomitant with mobility of the superficial layer after deep layer repair significantly influenced repair integrity. Good clinical results were obtained even in cases with high repair tension of the deep layer.

Level of evidence: Level III, Retrospective Cohort Comparison, Prognosis Study

Traumatic rotator cuff tears with concomitant shoulder dislocation: tear characteristics and postsurgical outcomes

A. Eibel, R.P. Reddy

DOI: <https://doi.org/10.1016/j.jse.2022.09.022>

Background: Arthroscopic rotator cuff repair has been shown to have favorable outcomes following traumatic rotator cuff tear with concomitant shoulder dislocation. The aim of this study was to compare outcomes and tear characteristics between patients who underwent arthroscopic rotator cuff repair following traumatic tear with shoulder dislocation to those without dislocation.

Methods: A retrospective review of 226 consecutive patients with traumatic rotator cuff tears who underwent arthroscopic repair between 2013 and 2017 with a minimum of 1-year follow-up was performed. Patients with traumatic dislocations and concomitant rotator cuff tears were placed in the Dislocation & Tear cohort (DT cohort) and were matched 1:2 with a second cohort sustaining traumatic cuff tears without dislocation (T cohort). Primary outcomes were injury characteristics including tendon involvement and atrophy and tear size and thickness. Secondary outcomes were postoperative strength and range of motion (ROM) in forward flexion (FF), external rotation (ER), and internal rotation (IR); patient-reported outcomes including Subjective Shoulder Value, visual analog scale, and American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form; complications including repair failure (defined as symptomatic retear confirmed on postoperative magnetic resonance imaging), infection, adhesive capsulitis, and impingement; and rates of revision surgery.

Results: There were 18 patients in the DT Cohort and 36 patients in the T Cohort with no significant differences in time to final follow-up (50.4 ± 24.5 months vs. 49.0 ± 30.4 months, $P = .73$). The DT cohort displayed a larger mean tear size (34 ± 12 mm vs. 19 ± 12 mm, $P = .01$) and had greater infraspinatus involvement (78% vs. 36%, $P = .004$) and subscapularis involvement (72% vs. 39%, $P = .02$) than the T cohort. With regard to strength, postoperative ER strength was less likely to be 5/5 in the DT Cohort (53% vs. 94% of patients with 5/5 strength, $P = .002$) compared with the T cohort. With regard to ROM, the DT cohort had significantly lower preoperative FF ($90^\circ \pm 55^\circ$ vs. $149^\circ \pm 33^\circ$, $P < .001$), ER ($36 \pm 21^\circ$ vs. $52^\circ \pm 14^\circ$, $P = .02$), and IR (5.4 ± 2.1 vs. 7.5 ± 1.2 , $P = .002$) compared with the T cohort but had similar FF, ER, and IR outcomes postoperatively. There were no differences between the groups for complications and postoperative patient-reported outcomes.

Conclusion: Traumatic rotator cuff tears with concomitant dislocations are associated with larger tear size and greater infraspinatus and subscapularis involvement than traumatic tears without dislocation. Arthroscopic repair of this injury is associated with lower preoperative ROM in FF, ER, and IR, as well as lower postoperative ER strength compared with traumatic tears without dislocation. Nonetheless, excellent patient-reported outcomes can be achieved following arthroscopic repair similar to patients without dislocation.

Level of evidence: Level III, Retrospective Cohort Comparison, Prognosis Study

Better functional outcomes and a lower infection rate can be expected after superior capsular reconstruction in comparison with latissimus dorsi tendon transfer for massive, irreparable posterosuperior rotator cuff tears: a systematic review

M. Mercurio, R. Castricini

DOI: <https://doi.org/10.1016/j.jse.2022.11.004>

Background: Massive, irreparable rotator cuff tears, if left untreated, may result in cuff tear arthropathy, which causes shoulder disability and pain. The primary outcome of this systematic review was to evaluate differences in functional outcomes between the arthroscopic superior capsular reconstruction (SCR) and latissimus dorsi tendon transfer (LDTT) for the treatment of massive, irreparable posterosuperior rotator cuff tears without arthritis. The secondary outcome was to compare complication and reoperation rates between the 2 surgical procedures.

Methods: The PubMed, MEDLINE, Scopus, and Cochrane Central databases were searched using keywords, and 20 studies were included in this review. Data extracted for quantitative analysis included the American Shoulder and Elbow Surgeons score, the Constant-Murley score, the subjective shoulder value, the range of motion, the visual analog scale for pain, numbers and types of complications, and reoperation rate. The preoperative fatty degeneration of the muscles and the preoperative and follow-up acromiohumeral distance and glenohumeral osteoarthritis according to the Hamada grading system were also reported.

Results: A total of 1112 patients were identified, among whom 407 and 399 underwent SCR and LDTT, respectively. The SCR group showed a higher mean age at the time of operation (64.5 ± 7.8 vs. 62.1 ± 8.9 years; $P < .001$). The SCR group showed a lower rate of previous surgical procedures on the shoulder (35 out of 407 vs. 111 out of 399; $P < .001$) and a shorter mean follow-up (30.4 ± 7.5 vs. 36.3 ± 10.3 months; $P < .001$). Patients who underwent SCR reported significantly better functionality and residual pain as measured by the Constant-Murley score (75.5 ± 11.2 vs. 65.6 ± 22.8 , $P < .001$), the American Shoulder and Elbow Surgeons score (84.3 ± 13 vs. 67.7 ± 23 , $P < .001$), the subjective shoulder value (79.4 ± 13 vs. 64.4 ± 23 , $P < .001$), and the visual analog scale (1.4 ± 2 vs. 2.8 ± 3 , $P < .001$) than patients who underwent LDTT. A greater acromiohumeral distance (5.8 ± 2.5 vs. 7.6 ± 2.7 , $P < .001$) was found in the SCR group. The SCR group showed a significantly lower infection rate (0.2% vs. 2.8%, $P = .003$) and a higher graft failure rate (12.3% vs. 6.8%, $P = .012$). No differences in terms of reoperation for graft failure (1% vs. 2.3% for SCR and LDTT, respectively; $P = .172$) or for conversion to reverse total shoulder arthroplasty (1.7% vs. 2% for SCR and LDTT, respectively; $P = .800$) were found.

Conclusion: Patients undergoing SCR report better functional outcomes and greater acromiohumeral distance than those undergoing LDTT. The LDTT group shows a significantly higher infection rate, while the SCR group shows a significantly higher graft failure rate, but there are no differences in terms of reoperation between the 2 surgical procedures.

Level of evidence: Level IV, Systematic Review

“Nearly off-track lesions” or a short distance from the medial edge of the Hill-Sachs lesion to the medial edge of the glenoid track does not seem to be accurate in predicting recurrence after an arthroscopic Bankart repair in a military population: a case-control study

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DOI: <https://doi.org/10.1016/j.jse.2022.10.003>

Background: On-track lesions with a short distance from the medial edge of the Hill-Sachs lesion to the medial edge of the glenoid track (nearly off-track) may predispose recurrence after arthroscopic Bankart repair (ABR) in the general population. The aim of this study was to determine if a shorter distance between the medial edge of the Hill-Sachs lesion and the medial edge of the glenoid track could accurately predict recurrence after an ABR in a high-demand military population. It was hypothesized that a shorter distance would not accurately predict recurrence.

Materials and Methods: A retrospective monocenter case-control study was performed at the Dutch Central Military Hospital. Patients with an on-track Hill-Sachs lesion who underwent a primary ABR between 2014 and 2019 with a minimal follow-up of 2 years and a preoperative magnetic resonance imaging (MRI) assessment received a questionnaire. The primary outcome was recurrence, defined as a complete dislocation or subluxation. Glenoid bone loss was assessed using a linear-based method on MRI. The distance from the medial edge of the Hill-Sachs lesion to the medial edge of the glenoid track was defined as the distance to dislocation (DTD). A receiver operating characteristic curve was created to determine the predictive value of the DTD for recurrence. Logistic regression was used to determine preoperative risk factors that predispose recurrence. Covariates were selected based on univariable analysis and included gender, body mass index, age at surgery and first dislocation, laterality, smoking habits, overhead shoulder activity during work, preoperative dislocations, sports type and level, bony or labral lesions on MRI, and DTD.

Results: In total, 80 patients with an average follow-up of 4.8 ± 1.9 years completed the questionnaire and were included in the analyses. Seventeen patients (21%) experienced recurrence at the final follow-up. No difference in DTD was observed among patients who experienced recurrence (9 ± 4 mm) compared with patients who did not (9 ± 5 mm; $P = .81$). The receiver operating characteristic curve demonstrated no predictive power of DTD for recurrence (area under the curve = 0.49). Smoking at the time of surgery (odds ratio: 3.9; confidence interval: 1.2-12.7; $P = .02$) and overhead shoulder movement during work (odds ratio: 9.3; confidence interval: 1.1-78.0; $P = .04$) were associated with recurrence according to the logistic regression analysis.

Conclusion: A shorter DTD demonstrated no accuracy in predicting recurrence in a military population. Smoking at the time of surgery and overhead shoulder activity during work were associated with recurrence; however, these analyses were underpowered to draw valid conclusions.

Level of evidence: Level III, Retrospective Cohort Comparison, Prognosis Study

The Effects of Arthroscopic Labral Repair on Patient-Reported Outcomes in the Setting of Periacetabular Osteotomy

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Background: It is currently unknown whether the addition of arthroscopic labral repair in the setting of periacetabular osteotomy (PAO) provides any clinical benefit.

Purpose/Hypothesis: The purpose of this study was to compare outcomes of patients who underwent arthroscopic labral repair concomitantly with PAO versus patients who underwent PAO alone. We hypothesized that there would be no difference in patient-reported outcome measures (PROMs) between the cohorts.

Study Design: Cohort study; Level of evidence, 3.

Methods: Patients undergoing PAO from a single-center prospective hip preservation registry were eligible for this study if they completed pre- and postoperative PROMs (minimum, 1 year). PROMs were collected at 1 year, 2 years, and latest follow-up at 6.05 years for PAO group and 4.2 years for scope/PAO group. The study group consisted of 53 patients who underwent arthroscopic labral repair at the time of their PAO, and the comparison group consisted of 170 patients who underwent PAO alone. A subset of the PAO group who had radiologic evidence of a detached labral tear ($n = 33$) was also compared with the rest of the PAO-alone group. PROMs were compared at every time point for both groups as well as the subset of patients who underwent PAO alone despite a labral tear.

Results: The mean follow-up of all patients was 2 years (range, 1-6 years). Overall, 85.2% of the PAO group and 85.7% of the scope/PAO group met the minimal clinically important difference for either the modified Harris Hip Score (mHHS) or the International Hip Outcome Tool (iHOT-33) at the most recent follow-up. There was no difference in improvement between groups (mHHS, $P = .670$; iHOT-33, $P = .944$). Patients who had a radiologically diagnosed detached labral tear and underwent PAO alone had no difference in outcomes when compared with the rest of the PAO cohort (mHHS, $P = .981$; iHOT-33, $P = .909$).

Conclusion: There was no significant benefit measured by PROMs at follow-up for concomitant arthroscopic labral repair in the setting of PAO.

Prospective Randomized Trial of Biologic Augmentation With Bone Marrow Aspirate Concentrate in Patients Undergoing Arthroscopic Rotator Cuff Repair

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Background: Although initial studies have demonstrated that concentrated bone marrow aspirate (cBMA) injections promote rotator cuff repair (RCR) healing, there are no randomized prospective studies investigating clinical efficacy.

Hypothesis/Purpose: To compare outcomes after arthroscopic RCR (aRCR) with and without cBMA augmentation. It was hypothesized that cBMA augmentation would result in statistically significant improvements in clinical outcomes and rotator cuff structural integrity.

Study Design: Randomized controlled trial; Level of evidence, 1.

Methods: Patients indicated for aRCR of isolated 1- to 3-cm supraspinatus tendon tears were randomized to receive adjunctive cBMA injection or sham incision. Bone marrow was aspirated from the iliac crest, concentrated using a commercially available system, and injected at the aRCR site after repair. Patients were assessed preoperatively and serially until 2 years postoperatively via the following functional indices: American Shoulder and Elbow Surgeons (ASES), Single Assessment Numeric Evaluation (SANE), Simple Shoulder Test, 12-Item Short Form Health Survey, and Veterans RAND 12-Item Health Survey. Magnetic resonance imaging (MRI) was performed at 1 year to assess rotator cuff structural integrity according to Sugaya classification. Treatment failure was defined as decreased 1- or 2-year ASES or SANE scores as compared with preoperative baseline, the need for revision RCR, or conversion to total shoulder arthroplasty.

Results: An overall 91 patients were enrolled (control, n = 45; cBMA, n = 46): 82 (90%) completed 2-year clinical follow-up and 75 (82%) completed 1-year MRI. Functional indices significantly improved in both groups by 6 months and were sustained at 1 and 2 years (all $P < .05$). The control group showed significantly greater evidence of rotator cuff retear according to Sugaya classification on 1-year MRI (57% vs 18%; $P < .001$). Treatment failed for 7 patients in each group (control, 16%; cBMA, 15%).

Conclusion: cBMA-augmented aRCR of isolated supraspinatus tendon tears may result in a structurally superior repair but largely fails to significantly improve treatment failure rates and patient-reported clinical outcomes when compared with aRCR alone. Additional study is warranted to investigate the long-term benefits of improved repair quality on clinical outcomes and repair failure rates.

Lower Extremity

Arthroscopy, Volume 39, Issue 4

Combined Borderline Acetabular Dysplasia and Increased Femoral Anteversion Is Associated With Worse Outcomes in Female Patients Undergoing Hip Arthroscopy for Femoroacetabular Impingement

J.D. Marland, B.S. Horton, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.10.028>

Purpose: To determine the relationship of increased femoral anteversion and borderline acetabular dysplasia on the outcomes of hip arthroscopy for femoroacetabular impingement in a female cohort of patients.

Methods: This is a retrospective study of female patients undergoing hip arthroscopy for femoroacetabular impingement. All patients had preoperative radiographs and computed tomography scans from which lateral center edge angle (LCEA) and femoral anteversion were measured. Patient outcome was quantified by preoperative and postoperative International Hip Outcome Tool 12-item instrument (iHOT-12). All patients had follow-up at 2 to 4 years postoperatively. Published values for minimum clinically important difference, substantial clinical benefit (SCB), patient acceptable symptomatic state (PASS), and a normal or abnormal hip were used to determine outcome as well as the final score and delta of the iHOT-12.

Results: There were 243 female patients included in the cohort (83% follow-up) who had iHOT-12 scores at 2- to 4-year follow-up (mean 36.9 months). Female patients with combined LCEA $\leq 25^\circ$ and femoral anteversion $> 20^\circ$ had lower final iHOT-12 scores ($P = .001$) and delta iHOT-12 ($P = .010$) and were less likely to achieve a normal hip ($P = .013$), minimum clinically important difference ($P = .018$), SCB ($P < .001$), or PASS ($P < .001$) and more likely to have an abnormal hip ($P = .002$). In addition, patients with an LCEA $\leq 25^\circ$ and normal femoral version were less likely to achieve a normal hip ($P = .013$), SCB ($P < .001$), and PASS ($P < .001$) compared with those with normal acetabular coverage (all $P < .05$). There was no difference in these outcome measures between the groups with an LCEA $> 25^\circ$ with or without increased femoral version.

Conclusions: Female patients with femoral anteversion $> 20^\circ$ and borderline acetabular dysplasia did poorly after hip arthroscopy. However, those with increased femoral anteversion and normal acetabular coverage had outcomes similar to control hips.

Level of Evidence: Level IV, case series.

Incidence of Venous Thromboembolism After Hip Arthroscopy Is Low With or Without Prophylaxis but Risk Factors Include Oral Contraceptive Use, Obesity, and Malignancy

J.T. Holler, R.T. Halvorson, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.10.029>

Purpose: To determine the incidence of and risk factors for symptomatic venous thromboembolism (VTE) after hip arthroscopy (HA) and thromboprophylaxis prescription utilization for this procedure.

Methods: The PearlDiver Mariner database was queried using Current Procedural Terminology codes to identify adult patients (aged ≥ 18 years) who underwent HA between 2010 and 2020. Patient demographic information, including age, oral contraceptive use, and medical comorbidities, as well as perioperative thromboprophylaxis utilization, was recorded using International Classification of Diseases codes and National Drug Codes. The incidence of postoperative VTE within 90 days was determined. Multivariate logistic regression was used to identify predictors of perioperative thromboprophylaxis utilization and risk factors for VTE.

Results: The queried records identified 60,181 patients who met the inclusion criteria. Of these patients, 367 (0.6%) experienced VTE, including deep venous thrombosis (0.5%) and/or pulmonary embolism (0.2%). Approximately 2.1% of patients used thromboprophylaxis, including aspirin (1.1%), low-molecular-weight heparin (0.9%), and oral factor Xa inhibitors (0.1%). Oral contraceptive pill use (adjusted odds ratio [aOR], 2.16; 95% confidence interval [CI], 1.34-3.46), obesity (aOR, 1.37; 95% CI, 1.05-1.79), and a history of malignancy (aOR, 1.69; 95% CI, 1.12-2.54) were associated with increased odds of experiencing VTE. Perioperative thromboprophylaxis (aOR, 0.52; 95% CI, 0.19-1.39) was not significantly associated with decreased odds of experiencing VTE. However, obesity (aOR, 1.17; 95% CI, 1.00-1.38) and hypertension (aOR, 1.17; 95% CI, 1.02-1.36) were associated with increased odds of thromboprophylaxis prescription utilization.

Conclusions: Although the overall risk of symptomatic VTE after HA remains low, oral contraceptive use, obesity, and a history of malignancy are associated with increased odds of thromboembolic events within 90 days. Routine thromboprophylaxis after HA may not be indicated in all patients but can be considered based on patient-specific risk factors.

Level of Evidence: Level III, retrospective prognostic comparative trial.

Lateral Meniscal Allograft Transplantation Provides a Chondroprotective Effect on Articular Cartilage: Quantitative 3-T Magnetic Resonance Imaging T2 Mapping

H.Y. Lee, S. Bin, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.10.030>

Purpose: This study aimed to assess the cartilage status in patients who underwent isolated lateral meniscus allograft transplantation (MAT) using preoperative and postoperative quantitative 3-T magnetic resonance imaging T2 mapping at midterm follow-up period.

Methods: Patients who underwent lateral MAT without cartilage treatment procedures between 2010 and 2019 were assessed by quantitative magnetic resonance imaging preoperatively and postoperatively. On the sagittal section image following the center of the lateral femoral condyle, the weight-bearing area of the articular cartilage was divided into 6 segments based on the meniscal coverage area from anterior to posterior direction. The mean T2 values of each of the 6 segments were measured for 3 regions of interest: overall, deep, and superficial layers. The change in T2 values was statistically analyzed by paired t-tests. The Lysholm score was used to evaluate clinical function.

Results: A total of 105 patients were included in the study. The mean follow-up period was 3.2 years (range 2.0-5.4 years). Among the 6 segments, the mean T2 value showed significant improvement in the overall layer of F2 (the middle weight-bearing area of femoral condyle) and TP3 (the posterior weight-bearing area of tibia condyle) segments ($P = .013$ and $.021$, respectively) and the superficial layer of the F3 (the posterior weight-bearing area of femoral condyle) segments ($P = .028$). The mean T2 value of all the other segments did not show a statistically significant change. The mean Lysholm score significantly improved from 66.5 ± 15.8 to 89.3 ± 10.0 ($P < .001$). Overall, 73.3% and 96.2% of the patients met the minimal clinically important difference and patient acceptable symptomatic state, respectively.

Conclusions: The mean T2 value of the articular cartilage of the weight-bearing area was either maintained or showed statistically significant improvement depending on the location following isolated lateral MAT. Thus, the transplanted meniscus seems to have a chondroprotective effect on the weight-bearing cartilage.

Level of Evidence: Level IV, retrospective therapeutic case series.

Mid-Term Outcomes of the All-Soft Quadriceps Tendon Autograft Are Noninferior to Hamstring Autograft in Primary Anterior Cruciate Ligament Reconstruction: Comparison With Minimum 5-Year Follow-Up

J.C. Brinkamn, S.V. Tummala, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.10.035>

Purpose: To compare the 5-year clinical and functional outcomes of the soft-tissue quadriceps tendon (QT) with those of the hamstring tendon (HT) autograft.

Methods: A retrospective review of patients undergoing anterior cruciate ligament reconstruction using either soft-tissue QT or double-tendon HT autograft with at least 5 years of follow-up was conducted. Surgical technique included anteromedial portal creation for the femoral tunnel and transtibial technique for the tibia. Graft fixation was achieved with interference composite screws for the QT and combination of interference composite screw and suture button for the HT cohort. The 2 groups were compared for differences in outcomes, including International Knee Documentation Committee (IKDC) score, Lysholm score, return to sport, and complications.

Results: A total of 37 patients with QT autograft and 46 HT autografts were included in the study, with a mean follow up of 69.9 months and 70.9 months, respectively. The QT group demonstrated a larger graft size on average (9.64 mm vs 7.90 mm, $P < .001$). The IKDC and Lysholm scores were similar between the 2 groups at 2-years' postoperatively. At 5 years' postoperatively, the QT group demonstrated significantly greater IKDC ($P = .018$) and Lysholm ($P = .007$) scores. The cohorts demonstrated similar rates of achieving minimal clinically important difference thresholds at both 2 and 5 years' postoperatively. The 2 groups also demonstrated comparable rates of return to sport, time to return, and postoperative complications.

Conclusions: Although the QT autograft demonstrated increased patient-reported outcome scores when compared with the HT at 5 years' postoperatively, there was no clinically significant difference between the cohorts at 2 or 5 years' postoperatively. The QT autograft is an effective alternative to HT autograft with noninferior results to the HT autograft at mid-term follow-up.

Level of Evidence: III, retrospective comparison study.

Athletes and Nonathletes Show No Difference in Symptoms or Function Prior to Knee Surgery, but Those With Chronic Symptoms Show Increased Pain Catastrophizing and Kinesiophobia

A.C. DiBartola, R.A. Magnussen, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.10.041>

Purpose: To determine whether preoperative psychological status before outpatient knee surgery is influenced by athletic status, symptom chronicity, or prior surgical history.

Methods: International Knee Documentation Committee subjective scores (IKDC-S), Tegner Activity Scale scores, and Marx Activity Rating Scale scores were collected. Psychological and pain surveys included the McGill pain scale, Pain Catastrophizing Scale, Tampa Scale for Kinesiophobia 11, Patient Health Questionnaire 9, Perceived Stress Scale, New General Self-Efficacy Scale, and Life Orientation Test–Revised for optimism. Linear regression was used to determine the effects of athlete status, symptom chronicity (>6 months or ≤6 months), and history of prior surgery on preoperative knee function, pain, and psychological status after matching for age, sex, and surgical procedure.

Results: In total, 497 knee surgery patients (247 athletes, 250 nonathletes) completed a preoperative electronic survey. All patients were age 14 years and older and had knee pathology requiring surgical treatment. Athletes were younger than nonathletes on average (mean [SD], 27.7 [11.4] vs 41.6 [13.5] years; $P < .001$). The most frequently reported level of play among athletes was intramural or recreational ($n = 110$, 44.5%). Athletes had higher preoperative IKDC-S scores (mean [SE], 2.5 [1.0] points higher; $P = .015$) and lower McGill pain scores compared to nonathletes (mean [SE] 2.0 [0.85] points lower; $P = .017$). After matching for age, sex, athlete status, prior surgery, and procedure type, having chronic symptoms resulted in higher preoperative IKDC-S ($P < .001$), pain catastrophizing ($P < .001$), and kinesiophobia scores ($P = .044$).

Conclusions: Athletes demonstrate no difference in symptom/pain and function scores preoperatively when compared to nonathletes of similar age, sex, and knee pathology, as well as no difference in multiple psychological distress outcomes measures. Patients with chronic symptoms have more pain catastrophizing and kinesiophobia, while those who have had prior knee surgeries have slightly higher preoperative McGill pain score.

Level of Evidence: Level III, cross-sectional analysis of prospective cohort study data.

Both Open and Arthroscopic All-Inside Anatomic Reconstruction With Autologous Gracilis Tendon Restore Ankle Stability in Patients With Chronic Lateral Ankle Instability

T. Su, A. Wang, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.11.035>

Purpose: To compare the return to sports and short-term clinical outcomes between the arthroscopic all-inside and the open anatomic reconstruction with gracilis tendon autograft for chronic lateral ankle instability (CLAI) patients.

Methods: From March 2018 to January 2020, 57 CLAI patients were prospectively included with arthroscopic all-inside anatomic reconstruction ($n = 31$) or open anatomic reconstruction ($n = 26$) with gracilis tendon autograft. The patients were evaluated before operation and at 3 months, 6 months, 12 months, and 24 months after surgery. The American Orthopaedic Foot and Ankle Society score (AOFAS), visual analog scale (VAS), and Karlsson-Peterson score were evaluated at each time point, and stress radiography with a Telos device was performed before surgery and at final follow-up. The time to return to full weightbearing walking, jogging, sports, and work, Tegner activity score, and complications were recorded and compared.

Results: All the subjective scores significantly improved after surgery from the preoperative level. Compared with the open group, the arthroscopic group demonstrated significantly earlier return to full weightbearing walking (8.9 vs 11.7 weeks, $P < .001$), jogging (17.9 vs 20.9 weeks, $P = .012$), and recreational sports (22.4 vs 26.5 weeks, $P = .001$) with significantly better AOFAS score and Karlsson score at 3 to 6 months, and better VAS score at 6 months after surgery. The 2 groups demonstrated no significant difference in the surgical duration or surgical complications. No significant difference was found in the clinical scores or stress radiographic measurements at 24 months after surgery ($P > .05$).

Conclusion: Compared with the open procedure, the arthroscopic all-inside anatomic lateral ankle ligament reconstruction with autologous gracilis tendon could achieve earlier return to full weightbearing, jogging, and recreational sports with less pain and better ankle functional scores at 3 to 6 months after surgery. Similar favorable short-term clinical outcomes were achieved for both techniques at 2 years after surgery.

Study Design: Level I, randomized controlled trial.

Mid- and Long-Term Outcomes Are Favorable for Patients With Borderline Dysplasia Undergoing Primary Hip Arthroscopy: A Systematic Review

M.S. Lee, J.S. Owens, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.12.030>

Purpose: To evaluate midterm outcomes, long-term outcomes, and survivorship in the borderline dysplastic population after primary hip arthroscopy.

Methods: A systematic review of current literature was performed with the following key words: “hip,” “arthroscopy,” “borderline dysplasia,” “borderline hip dysplasia,” “developmental dysplasia,” “ten-year,” “survivorship,” “10-year,” “5-year,” “five year,” “mid-term,” “long-term,” “outcomes,” “arthroscopic,” and “femoroacetabular impingement” in PubMed, Cochrane, and Scopus in March 2022 using the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines. The following information was recorded: title, author, publication date, study design, demographic, number of hips, follow-up time, study period, indications for hip arthroscopy, patient-reported outcomes (PROs), characteristics of patients converting to total hip arthroplasty (THA), and rates of secondary surgeries and conversion to THA were recorded. Survivorship was defined as not converting to THA. Kappa values for the title/abstract and full-text screening were calculated. Forest plots were created for PROs that were included in 3 or more studies.

Results: Six articles comprising 413 hips were included in the study. Three studies were Level III evidence, and 3 studies were Level IV evidence. Average follow-up ranged from 5.7 to 12.2 years. One study defined borderline hip dysplasia as lateral center-edge angle 18-25° and 5 defined it as lateral center-edge angle 20-25°. All studies included PROs and reported significant improvement after surgery in at least one PRO. Three studies reported clinical benefit and across the studies at least 70% of patients achieved minimum clinically important difference in at least one PRO. Rates of undergoing revision hip arthroscopy and THA ranged from 2.1% to 7% and 0% to 24%, respectively. Tönnis grade 2, Tönnis angle >15, and Outerbridge Grade IV cartilage damage were identified as predictors of conversion to THA.

Conclusions: Patients with borderline hip dysplasia undergoing primary hip arthroscopy demonstrated significant improvement in PROs at midterm and long-term follow-up. Survivorship at midterm follow-up was 98.2% (328/334 hips) and 76.3% (29/38 hips) at long-term follow-up.

Level of Evidence: Level IV, systematic review of Level III and Level IV studies.

The Radiographic Femoroepiphyseal Acetabular Roof Index Is a Reliable and Reproducible Diagnostic Tool in Patients Undergoing Hip-Preservation Surgery: A Systematic Review

D. Cohen, M. Ifabivi, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.11.041>

Purpose: To assess the utility of the femoroepiphyseal acetabular roof (FEAR) index as a diagnostic tool in hip-preservation surgery.

Methods: MEDLINE, EMBASE, and PubMed were searched from database inception until May 2022 for literature addressing the utility of the FEAR index in patients undergoing hip-preservation surgery, and the results are presented descriptively.

Results: Overall, there were a total of 11 studies comprising 1,458 patients included in this review. The intraobserver agreement for the FEAR index was reported by 3 of 11 studies (intraclass correlation coefficient range = 0.86-0.99), whereas the interobserver agreement was reported by 8 of 11 studies (intraclass correlation coefficient range = 0.776-1). Among the 5 studies that differentiated between hip instability and hip impingement, the mean FEAR index in 319 patients in the instability group ranged from 3.01 to 13.3°, whereas the mean FEAR index in 239 patients in the impingement group ranged from -10 to -0.77° and the mean FEAR index in 105 patients in the control group ranged from -13 to -7.7°. Three studies defined a specific cutoff value for the FEAR index, with 1 study defining a cutoff value of 5°, which correctly predicted treatment decision between periacetabular osteotomy versus osteochondroplasty 79% of the time with an AUC of 0.89, whereas another defined a cutoff of 2°, which correctly predicted treatment 90% of the time and the last study set a threshold of 3°, which provided an AUC of 0.86 for correctly predicting treatment decision.

Conclusions: This review demonstrates that the FEAR index has a high agreement and consistent application, making it a useful diagnostic tool in hip-preservation surgery particularly in patients with borderline dysplastic hips. However, given the variability in FEAR index cutoff values across studies, there is no absolute consensus value that dictates treatment decision.

Level of Evidence: Level IV; Systematic Review of Level II-IV studies.

Anterior Cruciate Ligament Revision Plus Lateral Extra-Articular Procedure Results in Superior Stability and Lower Failure Rates Than Does Isolated Anterior Cruciate Ligament Revision but Shows No Difference in Patient-Reported Outcomes or Return to Sports

A. Saithna, E. Monaco, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.12.029>

Purpose: To determine whether comparative clinical studies demonstrate significant advantages of revision anterior cruciate ligament reconstruction (RACLR) combined with a lateral extra-articular procedure (LEAP), with respect to graft rupture rates, knee stability, return to sport rates, and patient-reported outcome measures, compared with isolated RACLR.

Methods: A systematic review was conducted in accordance with Preferred Reporting Items for Systematic Reviews & Meta-Analyses Guidelines. A PubMed search was conducted using the key words “revision anterior cruciate ligament reconstruction” combined with any of the following additional terms, “lateral extra-articular tenodesis” OR “anterolateral ligament reconstruction” OR “Lemaire.” All relevant comparative clinical studies were included. Key clinical data were extracted and evaluated.

Results: Eight comparative studies (seven Level III studies and a one Level IV study) were identified and included. Most studies reported more favorable outcomes with combined procedures with respect to failure rates (0%-13% following RACLR+LEAP, and 4.4%-21.4% following isolated RACLR), postoperative side-to-side anteroposterior laxity difference (1.3-3.9 mm following RACLR+LEAP and 1.8-5.9 mm following isolated RACLR), and high-grade pivot shift (0%-11.1% following RACLR+LEAP and 10.2%-23.8% in patients following isolated RACLR). There were no consistent differences between isolated and combined procedures with respect to return to sport or patient-reported outcome measures.

Conclusions: This systematic review demonstrates that the addition of a LEAP to RACLR was associated with an advantage with respect to ACL graft failure rates and avoidance of high-grade postoperative knee laxity across almost all included studies.

Level of Evidence: IV, Systematic review of level III to IV studies.

Good clinical outcomes and return to sports after hybrid closed-wedge high tibial osteotomy

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Purpose: This study aimed to investigate preoperative sports participation and postoperative clinical outcomes including a return to sports (RTS) after hybrid closed-wedge high tibial osteotomy (CWHTO) for medial compartment osteoarthritis of the knee. Characteristic of Hybrid CWHTO was defined as extra-articular lateral closed and medial open wedge osteotomy.

Methods: The patients who underwent hybrid CWHTO from January 2016 to December 2018 were retrospectively reviewed and divided them into sports and non-sports groups. The preoperative demographic and radiographic characteristics were compared in both groups. And the clinical outcomes including the Japanese Orthopaedic Association (JOA) score, visual analogue scale (VAS), Lysholm score, University of California at Los Angeles (UCLA) activity score, and RTS in the sports group were also investigated. Statistical analysis was performed for comparisons among the preoperative factors between the two groups. Influence of sports impact and bone union of fibular osteotomy was also statistically investigated for RTS.

Results: Of the 161 knees (129 patients; 46 males, 83 females), 20 knees (16 patients; 13 males, 3 females; 12.3%) belonged to sports group. Although there were no significant differences regarding the age and radiographic parameters, there were significant differences in the body mass index and proportion of males between both groups. The JOA, VAS, Lysholm, and UCLA activity scores significantly improved after surgery. RTS was 80% at a mean duration of 7.2 ± 3.1 months. RTS in the high-impact sports group was significantly lower than that in the low-impact sports group (high-impact 60% vs. low-impact 100%, $p = 0.043$). There was no significant difference in RTS regarding bone union after fibular osteotomy.

Conclusion: The clinical outcomes including RTS were satisfactory in patients with hybrid CWHTO.

Level of evidence: IV

Distraction Gap Needed for Safe Central Compartment Access in Hip Arthroscopy

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Background: Sufficient distraction of the hip is the key to a safe central compartment (CC) approach in hip arthroscopy. However, an adequate distraction gap has not been scientifically identified.

Purpose: To determine the sufficient amount of distraction that could predict a successful CC access as well as to identify the risk factors for a failed or difficult CC access.

Study Design: Case-control study; Level of evidence, 3.

Methods: All patients who underwent hip arthroscopy by a single surgeon between January 2018 and April 2019 were prospectively enrolled. We analyzed gaps of the hip on 4 C-arm fluoroscopic images: nondistraction, preoperative manual traction, preoperative maximal traction (without distension), and intraoperative maximal traction (at the end of CC procedures in a successful CC approach or after peripheral compartment procedures in a failed or difficult CC approach). A failed CC approach was defined as failure in introducing the anterolateral portal to the CC under arthroscopic control; a difficult CC approach was defined as the presence of an incomplete diagnostic round in the CC because of a small distraction. The amount of distraction was evaluated by the ratio of the distracted gap to the undistracted gap. Patients were classified into the successful CC access group (group 1) and the failed/difficult CC access group (group 2). The amount of distraction, demographic characteristics, and preoperative radiographic parameters were compared between the groups.

Results: A total of 240 patients were included in this study. Group 1 consisted of 205 patients (113 males and 92 females; mean \pm SD age, 34.5 ± 11.4 years), and group 2 consisted of 35 patients (27 males and 8 females; age, 32.5 ± 11.2 years). The preoperative joint space width was not significantly different between group 1 (mean \pm SD, 3.89 ± 0.83 mm) and group 2 (3.68 ± 0.68 mm). The ratio of the amount of distraction at lateral gaps under all traction conditions was significantly greater in group 1 compared with group 2 (1.50 ± 0.54 vs 1.26 ± 0.35 , respectively, under preoperative manual traction; 2.84 ± 0.76 vs 2.03 ± 0.63 under preoperative maximal traction; 3.36 ± 0.96 vs 2.50 ± 0.79 under intraoperative maximal traction). An increase of the lateral gap by >2.2 times ($P < .001$) under preoperative maximal traction and by >2.7 times ($P < .001$) under intraoperative maximal traction could predict successful CC access. Male sex (odds ratio [OR], 2.94; $P = .017$) and increased lateral center-edge angle (OR, 1.08 for every 1° increase; $P = .004$) were significant risk factors for failed/difficult CC access.

Conclusion: An increase of the lateral gap by >2.2 times during an unsterile traction test without joint distension could predict successful CC access. Male sex and increased lateral center-edge angle were risk factors for a failed or difficult CC access.

Return to Work After Primary Hip Arthroscopy: A Systematic Review and Meta-analysis

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Background: Hip arthroscopy is a procedure commonly performed to correct various hip pathologies such as femoroacetabular impingement and labral tears. These hip pathologies commonly affect young, otherwise healthy patients. The recovery after hip arthroscopy can prevent patients from returning to work and impair performance levels, having significant economic repercussions. To date, there has been no cumulative analysis of the existing literature on return to work after hip arthroscopy.

Purpose: The purpose of this study was to perform a systematic review of the existing literature regarding return to work after hip arthroscopy and analysis of factors associated with the ability to return to work and time to return to work.

Study Design: Systematic review and meta-analysis; Level of evidence, 4.

Methods: A literature search of the MEDLINE, EMBASE, and Cochrane Library databases was performed based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Studies assessing functional outcomes and return to work, including return to military duty, after hip arthroscopy were included. Patients' ability to return to work, as well as time to return, was compared between selected studies. Where available, workers' compensation status as well as type of work was compared. All statistical analysis was performed using SPSS, Version 22. $P < .05$ was considered statistically significant.

Results: Twelve studies with 1124 patients were included. Patients were followed for an average of 17.6 months. Using weighted means, the average rate of return to work was 71.35%, while full return to previous work duties was achieved at a rate of 50.89%. Modification to work duties was required at a rate of 15.48%. On average, the time to return to work was 115 days (range, 17-219 days). Rate of return by patients with workers' compensation status was found to be 85.15% at an average of 132 days (range, 37-211 days). Rate of return to work in workers performing professions reported as strenuous vs light (ie, mostly sedentary) jobs showed a statistically higher return to work in light professions (risk ratio, 0.53; 95% CI, 0.41-0.69).

Conclusion: After hip arthroscopy, there is a high rate of return to work at an average of 115 days after surgery. However, full return to work was achieved by only half of patients upon final follow-up.